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# The Tropical Tropopause Layer 1960–2100

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Abstract. The representation of the Tropical Tropopause Layer (TTL) in 13 different Chemistry Climate Models (CCMs) designed to represent the stratosphere is analyzed. Simulations for 1960–2005 and 1980–2100 are analyzed. Simulations for 1960–2005 are compared to reanalysis model output. CCMs are able to reproduce the basic structure of the TTL. There is a large (10 K) spread in annual mean tropical cold point tropopause temperatures. CCMs are able to reproduce historical trends in tropopause pressure obtained from reanalysis products. Simulated historical trends in cold point tropopause temperatures are not consistent across models or reanalyses. The pressure of both the tropical tropopause and the level of main convective outflow appear to have decreased (increased altitude) in historical runs as well as in reanalyses. Decreasing pressure trends in the tropical tropopause and level of main convective outflow are also seen in the future. Models consistently predict decreasing tropopause and convective outflow pressure, by several hPa/decade. Tropical cold point temperatures are projected to increase by 0.09 K/decade. Tropopause anomalies are highly correlated with tropical surface temperature anomalies and with tropopause level ozone anomalies, less so with stratospheric temperature anomalies. Simulated stratospheric water vapor at 90 hPa increases by up to 0.5–1 ppmv by 2100. The result is consistent with the simulated increase in temperature, highlighting the correlation of tropopause temperatures with stratospheric water vapor.

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